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(54) Auxiliary skin cooling device for a hair-removing apparatus.

(57) An auxiliary device (5) for a hair-removing apparatus (1) is provided which comprises a cooling element which has a heat conducting surface (6), capable of cooling the skin prior to removal of hair by the apparatus's hair-removing unit (2). The cooling of the skin substantially reduces the pain usually associated with hair removal by such apparatuses.

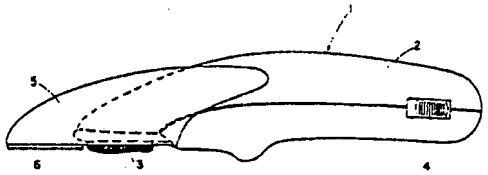

Fig.1

AUXILIARY SKIN COOLING DEVICE FOR A HAIR-REMOVING APPARATUS

The invention is generally in the field of cosmetic apparatuses and more specifically concerns an auxiliary device for a hair removing apparatus which is capable of cooling the skin from which the hair is to be removed, thereby significantly decreasing the pain which is generally associated with such removal of hair.

Removal of unwanted hair for cosmetic purposes from various parts of the body has become common practice, especially for women. Hair from non-facial skin is usually removed by plucking and various devices adapted for such hair removal have been described in the literature. Swiss Patent No. 268,696 describes a manually-operated depilatory device which comprises helical springs which are rotated when the device is moved along the skin, and hair that is caught by the coils are plucked away.

The principle of the rotating helical spring was incorporated into a electrically-powered depilatory device disclosed in U.S. Patent No. 4,524,772. The device disclosed there comprises a helical spring, consisting of a helical adjacent windings, which is driven to rotate around its axis by an electric motor. In operation, the rotating helical spring is moved along the surface of a hair-bearing skin portions, the hair is caught by the rotating helical spring and plucked.

A somewhat similar device is described in U.S. Patent No. 4,726,375 in which, however, the helical spring of U.S. Patent No. 4,524,772 is replaced by a flexible hair-plucker body which consists of a plurality of gaps on its outer surface which open and close during its rotation so as to receive, pluck and eject hair growing on a skin portion on which the hair-plucker body moves.

The known hair-removing devices have a fundamental drawback in that the plucking of the hair can be very painful. This drawback limits considerably the widespread use of such device, particularly for sensitive skin surfaces.

It is the object of the present invention to provide an auxiliary device for hair-removing apparatus which reduces the pain associated with hair plucking.

GENERAL DESCRIPTION OF THE INVENTION

The present invention is based on the realisation that the pain associated with hair plucking by a hair-removing apparatus may be avoided or significantly decreased if the skin is anaesthetised by cooling prior to the removal of hair. This is achieved in accordance with the invention by adding an auxiliary skin cooling device to the hair removing apparatus.

The present invention provides an auxiliary device for a hair-removing apparatus capable of reducing sensitivity of the skin to pain prior to hair removal, comprising a cooling element adapted to cooling the skin from which hair is to be removed (hereinafter to be referred to at times as "the auxiliary device").

The present invention also provides a hair-removing apparatus characterised in that it comprises an auxiliary device capable of reducing sensitivity of-the skin to pain by cooling it prior to hair removal by the apparatus's hair-removing unit.

The auxiliary device will generally comprise a cooling element which will be placed in front of the hair-removing unit of the apparatus. In operation the user usually moves the apparatus in a forward direction on the surface of the skin which will thus be in contact first with said cooling element and only then with said hair-removing unit of the apparatus. consequently the skin will be cooled prior to the removal of hair by said apparatus and thus during said removal, the skin will be in a a temporary state of anaesthesia.

In some embodiments of the present invention, the cooling element in the auxiliary device will be a circumferential or semi-circumferential element partially or entirely surrounding the hair-removing unit of the apparatus or several cooling elements will be provided, together partially or entirely surrounding the hair-removing unit from all sides. This will enable to move the apparatus in other directions than formed while cooling the skin prior to the removal of hair.

The attachment of the cooling element to the body of the auxiliary device or the attachment of the auxiliary device to the apparatus may not necessarily be always rigid. It may sometimes be desired that one or both of said attachment be elastic. In the case one of said attachments is elastic the cooling element may be devised so that in the slack state of said attachment or when applying a light force thereon, its lower. skin touching, surface, will be at a level below that of the hair-removing unit. Thus in operation at first only said surface of the cooling element will touch the skin. Thereafter, upon the application of a stronger downward force on the apparatus, the hair-removing element will be lowered and thereafter the cooling of the skin will continue coincidentally with the removal of hair. Such an arrangement allows the user to first cool the skin and only after the loss of sensation to start the hair-removing operation.

The cooling device may-comprise a cold accumulating cooling element or alternatively a thermoelectric cooling element. A cold accumulating cooling element should be cooled prior to use, e.g. by placing it in an ice-box, while a thermoelectric cooling element is devised to generate cold during operation.

While a cold accumulating cooling element may in theory be made of a metal alloy or another heat conducting material, this is in fact impractical since the cold capacity of such a material is relatively low and therefore, in order to achieve substantial cooling of the skin for prolonged periods of time, it will have to be large and thus too heavy for comfortable use.

A frozen liquid has a very high cold capacity at the phase-changing temperature, i.e the temperature in which it melts. It has been realized, in accordance with the invention that this physical phenomenon may be used to advantage of devising cold accumulating elements which are both small and have a large cold capacity. Thus in accordance with the invention the cold accumulating cooling element preferably comprises a small compartment filled with a liquid which is capable of changing its phase from solid to liquid (or vice versa) at a certain desired temperature. Such a liquid, to be referred to hereinafter as a "phase changing liquid" may be a mixture of alcohol, such as ethanol, in water or an aqueous salt solution, all of which change their phase at a temperature below 0°C Examples of such phase changing liquids are a mixture of 10% ethanol in water or a 7% NaCl solution, both of which have a phase changing temperature of about -6°C, (which temperature is obtainable in most domestic refrigerator's ice-boxes).

In addition to the phase changing liquid, said compartment may contain a certain amount of a heat conducting filler such as metal powder, which significantly improves the performance of such a cold accumulating cooling element.

Such cold accumulating cooling elements, when cooled below the phase changing temperature of the phase-changing liquid, have a cold capacity per unit volume which is several orders of magnitude higher than that of a metal alloy. Furthermore, unlike such an alloy the temperature of such a cooling element remains essentially constant over a relatively prolonged period of time.

The above described cold accumulating cooling element confers coldness to the skin through a heat conducting bottom wall portion, e.g. made of metal, while its other wall portions are preferably heat insulating, either made of an insulating material or coated by such.

Since a heat accumulating cooling device has to be cooled prior to use, either the entire auxiliary device or the cold accumulating cooling element should preferably be detachable in order to avoid the need to place the entire apparatus in the cold. Thus for cooling, the auxiliary device or the cold accumulating cooling element are detached and then placed in the cold for a sufficient amount of time for the phase-changing liquid to freeze.

As mentioned above, the cooling element may also be a thermo-electric element. Thermo-electric elements are known per se and generally consist of two semi-conductor branches connected in series, one of which has n-conductivity and the other p-conductivity. These two branches are situated between two commutation plates which realise the hot and cold junctions of the thermo-electric element, generated as a result of a DC current flowing through these junctions. It is a characteristic feature of such elements that heat is pumped from one junction to the other, namely one of the plates cools while the other heats up. In an auxiliary device utilising a thermo-electric element, the cold junction's commutation plate is brought into contact with the skin or cools another heat conducting, e.g. metal, plate which in turn is brought into contact with the skin.

For efficient cooling of the skin the heat produced at the hot junction has to be removed. This may be performed by an attached heat conducting body having heat exchange fins or pins attached thereto, or integral therewith, usually on its upper surface. For increasing the efficiency of the heat conduction between the heated plate and the heat exchange fins or pins, the heat conducting body may comprise an internal compartment partially filled with a liquid which boils at a relatively low temperature such as various types of freon of the type which boils between 30° - 40°C. The improved heat conduction is a result of the evaporation of liquid in consequence to heating by the hot commutation plate and then subsequent condensation on the internal compartments' surfaces which underly those surfaces of the heat conduction body which are are provided with heat exchange fins or pins. Possibly, some of the internal surfaces of said compartment may be coated with a capillary coating for increasing the efficiency of the heat conduction.

The heat from the heat exchange fins or pins is removed either by natural convection or by the aid of an air stream produced by a small blower fan.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a side elevation of a conventional hair-removing apparatus, having an auxiliary cooling device of the invention attached thereto;

Fig. 2 is an upper view of the hair-removing apparatus of Fig. 1;

Fig. 3 is a bottom view of the apparatus of Figs. 1 and 2;

Fig. 4 is a top view of an auxiliary cooling device, having a cold accumulating cooling element;

Fig. 5 is a cross-section through the line V-V in Fig. 4;

Fig. 6 is a side elevation of a hair-removing apparatus having an auxiliary cooling device, with part of its casing broken away showing a thermo-electric cooling element attached to 10 heat exchange pins bearing cooling body;

Fig. 7 shows a different embodiment of an auxiliary cooling device, with part of its casing broken away showing a thermo-electric element bearing heat exchange pins and a heat removing fan.

DETAILED DESCRIPTION OF THE INVENTION

The invention will at times be described in the following, with reference to the non-limiting specific embodiments depicted in the annexed drawings. It may easily be appreciated by the man of the art that various modifications of these embodiments are possible, all being within the scope of the invention, as defined in the claims.

The auxiliary cooling device in accordance with the invention may be designed to fit any hair-removing device. In the annexed drawings the invention is described, only as an example, with reference to a known hair-removing apparatus manufactured in accordance with U.S. Patent 4,524,772, which is sold throughout the world under the tradename **EPILADY** (manufactured by MEPRO, Hagoshrim, Israel).

The hair-removing apparatus 1 shown in Figs. 1, 2 and 3 comprises a casing 2, a rotatable helical coil 3, which is the hair-removing unit of the apparatus, and an electric, on-off, switch 4. The electric current for the apparatus operation is provided by an external power supply (not shown) connected to the apparatus via a socket at the apparatus rear (also not shown). The auxiliary device 5 is shaped so as to fit the front casing 2 of the hair-removing apparatus 1 and comprises a cooling element of which only the lower skin touching surface 6 is seen protruding below the lower edge of the auxiliary device 5.

With particular reference to Fig. 3 it may be seen that the lower surface 6 of the cooling element is essentially in front of the hair-removing unit. It should be emphasised that it may also be possible in accordance with various other embodiments to design the auxiliary cooling device so that its cooling element's lower surface will be circumferential or semi-circumferential so that it will totally or partially surround the hair-removing unit.

The cooling element in the auxiliary cooling device of 15 the present invention should preferably have temperature below 0°C at the skin touching surface. In an embodiment of the auxiliary skin-cooling device shown in Figs. 1, 2 and 3, the lower surface 6 of the cooling element is slightly above the lower level of the hair-removing unit 3 of apparatus 1. In an alternative embodiment, the auxiliary unit is elastically fastened to the apparatus and the cooling element may thus be devised in a manner that its lower surface will be at a lower level than that of the hair-removing unit. While light pressure is applied, only said lower portion is in contact with the skin. When applying a stronger pressure on the apparatus, the hair-removing unit is lowered to the skin and brought into contact therewith.

The auxiliary cooling device 7 in the embodiment shown in Figs. 4 and 5 consists of a plastic base portion 8 and a cooling element 9. Base portion 8 may be detachably attached to the casing of the hair-removing apparatus (not shown) by various means such as, for example, by a hook-velvet fabric, e.g. that sold under the trade name VELCRO (Velcro S.A. Lenzerheide, Switzerland), one piece of which will be attached to a base portion 8, and a complementary piece on a matching surface of the casing of said apparatus.

The cooling element 9 is a small container consisting of plastic side wall portions 10 and 10′ which are integral with base portion 8 and forming together with a heat conductive metal bottom wall portion 11 a liquid-containing compartment 12. Thus, the only heat conducting wall portion of compartment 12 is bottom wall portion 11, while the other wall portions 10 and 10′ are insulating. The liquid is preferably a solution having a phase transition temperature below 0 6, such as an aqueous ethanol solution (e.g. 10% ethanol in water), other aqueous alcohol solutions, a salt solution (e.g. 7% NaCl in water) and the like. Since during freezing a liquid solution slightly expands in volume, the internal compartment has a small enclosed volume of gas 13 to allow for such an expansion.

In such a cooling element the temperature remains fairly constant over a prolonged period of time, due to the solid-liquid phase transition which occurs at a constant temperature - the phase changing temperature. Thus, for example, in the above specified. solutions, transition between solid and liquid is at about -6° to -7°C, and in operation the surface of the cooling elements will remain at about this temperature for a relatively long period of time.

In the auxiliary cooling device shown in Fig. 6,

the cooling element is a thermo-electric element 14, having attached thereto a heat conducting body 15 bearing heat-exchange fins 16 on its upper surface and has an internal elongated heat conducting compartment 17 which contains a liquid, such as freon, which boils at a temperature between 30 -40° C. Heat is transported to the fins by evaporation of the liquid and its subsequent condensation on the fin-bearing portions of said compartment. In order to ensure proper heat exchange, the upper front portion 19 of the casing of the auxiliary cooling device has to be perforated and may at times even be removed.

The thermo-electric element requires a supply of DC current which is preferably provided by an external power supply (not shown) which may be the same as that providing power to the apparatus.

While in the embodiment shown in Fig. 6 heat is removed by convection, in the embodiment shown in Fig. 7, heat is removed by means of a small dual-sided blower fan 20 (only one side of which is seen in this view). As a result of the blower fan's rotation, air enters through opening 21 and flows through conduit 10 22 over heat exchange pins 23 and t-hen after heating, out through opening 24 designed to direct the air flow upwards to avoid skin heating.

Claims

1. An auxiliary device (5) for a hair removing apparatus (1) capable of reducing sensitivity of the skin to pain prior to - hair removal, comprising a cooling element (6) adapted to cooling the skin from which hair is to be removed.

2. A hair removing apparatus (1) characterized in that it comprises an auxiliary device (5) according to claim 1.

3. An apparatus according to claim 2, wherein either the attachment of the cooling element to the body of the auxiliary device and/or the attachment of the auxiliary device to the casing of said apparatus is elastic.

4. An auxiliary device according to claim 3, wherein in a slack state of said elastic attachment, or when light pressure is applied, the lower, skin touching surface (6) of the cooling element is at a lower level, in relation to the said apparatus's frame of reference than that of the hair-removing unit (3) of the apparatus, and is capable of changing its relative level in consequence of the application of force on its said surface.

5. An apparatus according to any one of claims 2 to 4, wherein the auxiliary device (7) comprises a cold accumulating cooling element (9).

6. An apparatus according to claim 5, wherein said element comprises a small compartment (9), the bottom portion of which (11) is heat conductive, and which contains a liquid capable of changing its liquid to solid phase at a desired temperature.

7. An apparatus according to claim 6, wherein said liquid changes its phase below 0° C.

8. An apparatus according to claim 7, wherein said liquid is selected from the group consisting of alcohol - water mixtures and an aqueous salt solutions.

9. An apparatus according to any one of claims 6 to 8, wherein said compartment also contains a heat conducting particulate filler.

10. An apparatus according to any one of claims 5 to 9, wherein said auxiliary device is detachable.

11. An apparatus according to any one of claims 2 to 4, wherein the auxiliary device comprises a thermo-electric cooling element (14) and an attached heat conducting body (15) bearing heat exchange fins or pins (16).

12. An apparatus according to claim 11, wherein the heat conducting body comprises an internal compartment (17) partially filled with a liquid (18) which has a relatively low boiling temperature.

13. An apparatus according to claims 11 or 12, wherein the auxiliary device comprises a small blower fan (20) for the removal of accumulated heat from heat exchange fins or pins (23).

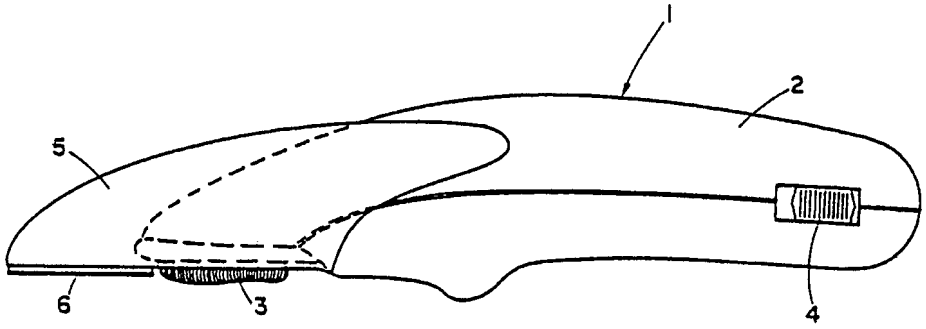

Fig.1

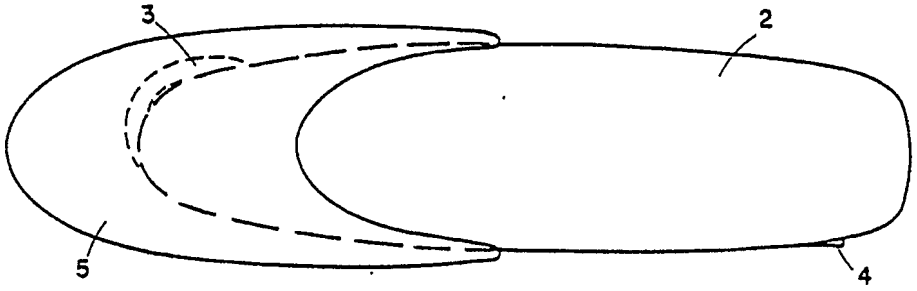

Fig.2

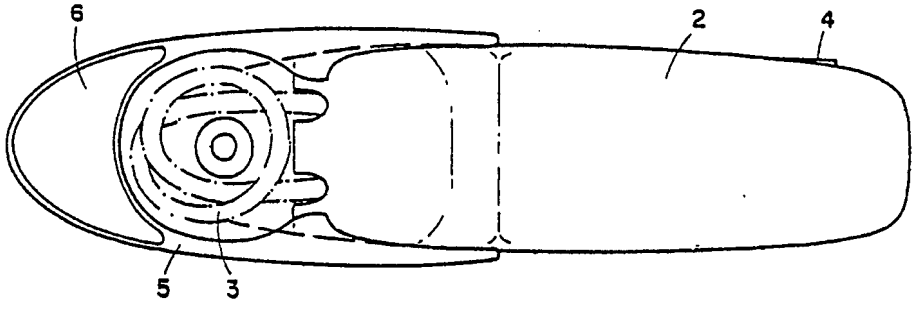

Fig.3

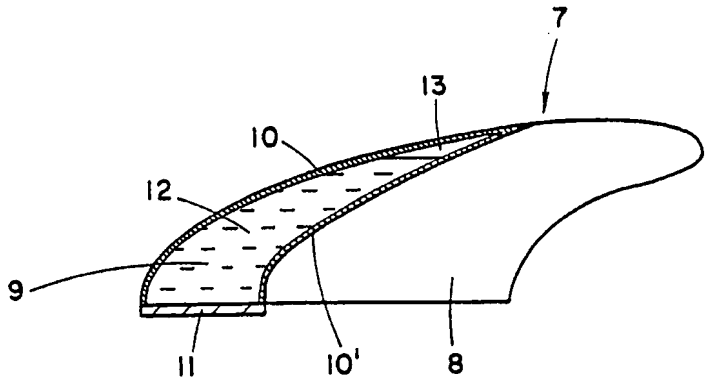

Fig. 5

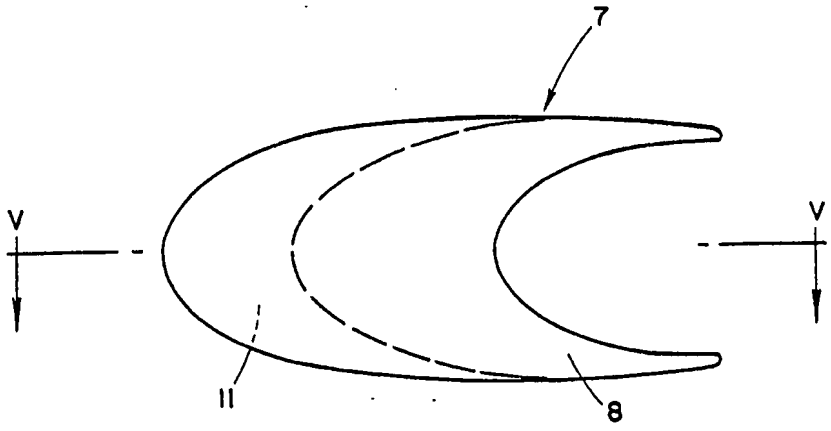

Fig. 4

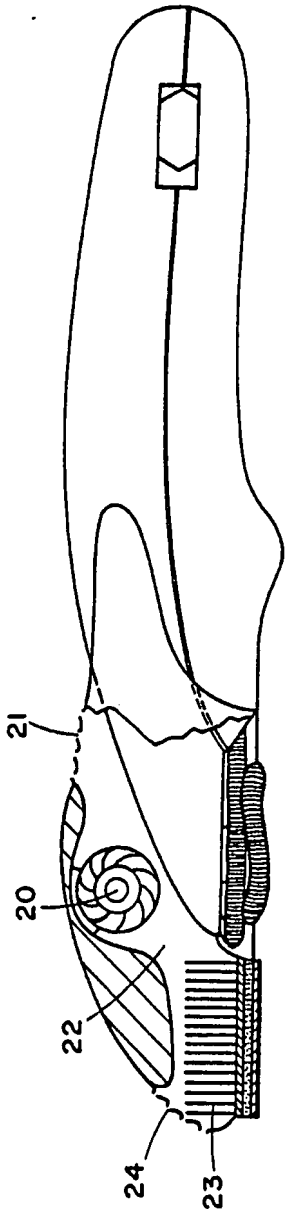

Fig.6

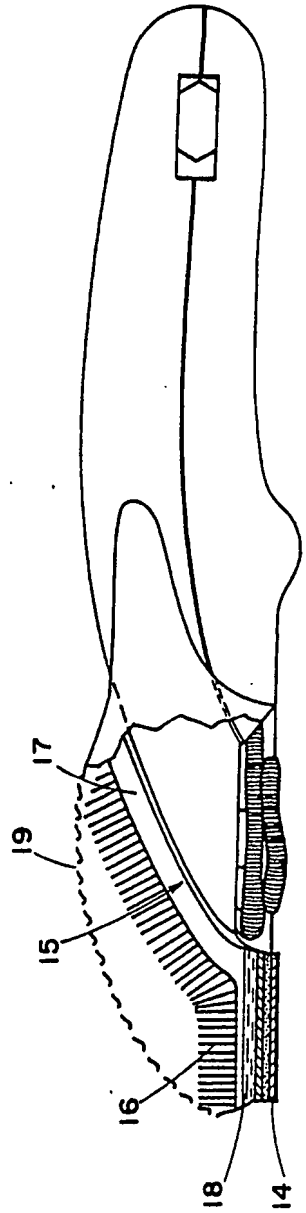

Fig.7